

#312

IMP-I

MAGNETOMETER

15 SEC. B VECTORS

71-019A-01B  
*(RESTORED)*

IMP-I

15 SECOND B VECTORS

71-019A-01B

THIS DATA SET HAS BEEN RESTORED. ORIGINALLY THERE WERE 62 9-TRACK, 1600 BPI STANDARD LABEL TAPES WRITTEN IN BINARY. THERE ARE 13 RESTORED TAPES. THESE TAPES WERE RUN THROUGH A PROGRAM WHICH EXTRACTED THE FILE MARK, SO THERE IS ONE FILE PER RESTORED TAPE. EACH FILE OF THE RESTORED DATA SET CONTAINS 9090 PHYSICAL RECORDS (EXCEPT THE LAST TAPE DR/DS01588 WHICH CONTAINS 145 PHYSICAL RECORDS). EACH PHYSICAL RECORD OF THE RESTORED DATA SET IS 16,564 BYTES LONG AND CONSISTS OF 4 CONTROL BYTES FOLLOWED BY 60 LOGICAL RECORDS, EACH BEING 276 BYTES LONG. THE TAPES WERE CREATED ON A 360/75 COMPUTER. THE DR AND DS TAPES ARE 9-TRACK, 6250 BPI. THE DR AND DS NUMBERS ALONG WITH THE CORRESPONDING D NUMBERS AND THE TIME SPANS ARE AS FOLLOWS:

| DR#     | DS#     | D#     | FILES | TIME SPAN           |
|---------|---------|--------|-------|---------------------|
| DR01576 | DS01576 | D18781 | 1     | 03/13/71 - 04/03/71 |
|         |         | D18782 | 1     | 04/03/71 - 04/24/71 |
|         |         | D18783 | 1     | 04/24/71 - 05/10/71 |
|         |         | D18784 | 1     | 05/10/71 - 06/04/71 |
|         |         | D18785 | 1     | 06/04/71 - 06/25/71 |
| DR01577 | DS01577 | D18786 | 1     | 06/25/71 - 07/16/71 |
|         |         | D18787 | 1     | 07/16/71 - 08/05/71 |
|         |         | D18788 | 1     | 08/05/71 - 08/26/71 |
|         |         | D18789 | 1     | 08/26/71 - 09/16/71 |
|         |         | D18790 | 1     | 09/16/71 - 10/04/71 |
| DR01578 | DS01578 | D18790 | 1     | 10/04/71 - 10/07/71 |
|         |         | D18791 | 1     | 10/07/71 - 10/27/71 |
|         |         | D18792 | 1     | 10/27/71 - 11/17/71 |
|         |         | D23664 | 1     | 11/17/71 - 12/08/71 |
|         |         | D23665 | 1     | 12/08/71 - 12/20/71 |
|         |         | D23666 | 1     | 12/20/71 - 12/29/71 |
|         |         | D23667 | 1     | 12/29/71 - 01/12/72 |
| DR01579 | DS10579 | D23667 | 1     | 01/12/72 - 01/18/72 |
|         |         | D23668 | 1     | 01/18/72 - 02/08/72 |
|         |         | D23669 | 1     | 02/08/72 - 02/29/72 |
|         |         | D23670 | 1     | 02/29/72 - 03/21/72 |
|         |         | D23671 | 1     | 03/21/72 - 04/10/72 |
|         |         | D23672 | 1     | 04/10/72 - 04/20/72 |

| LINE    | JOB#    | REC#     | DATE | FILED BY            |
|---------|---------|----------|------|---------------------|
| DR01580 | DS01580 | D23672   | 1    | 04/20/72 - 05/01/72 |
|         |         | D23673   | 1    | 05/01/72 - 05/22/72 |
|         |         | D23674   | 1    | 05/22/72 - 06/12/72 |
|         |         | D23675   | 1    | 06/12/72 - 07/02/72 |
|         |         | D23676   | 1    | 07/02/72 - 07/23/72 |
|         |         | D23677   | 1    | 07/23/72 - 07/28/72 |
| DR01581 | DS01581 | D23677   | 1    | 07/29/72 - 08/13/72 |
|         |         | D23678   | 1    | 08/13/72 - 09/03/72 |
|         |         | D23679   | 1    | 09/03/72 - 09/23/72 |
|         |         | D23680   | 1    | 09/23/72 - 10/14/72 |
|         |         | D23681   | 1    | 10/14/72 - 11/04/72 |
|         |         | D23682   | 1    | 11/04/72 - 11/25/72 |
|         |         | D23683   | 1    | 11/25/72 - 11/28/72 |
| DR01582 | DS01582 | D23683   | 1    | 11/28/72 - 12/15/72 |
|         |         | D29246   | 1    | 12/15/72 - 01/05/73 |
|         |         | D23684   | 1    | 01/05/73 - 01/26/73 |
|         |         | D23685   | 1    | 01/26/73 - 02/20/73 |
|         |         | D23686   | 1    | 02/16/73 - 03/08/73 |
|         |         | D23687   | 1    | 03/08/73 - 03/12/73 |
| DR01583 | DS01583 | D23687   | 1    | 03/12/73 - 03/29/73 |
|         |         | D23688   | 1    | 03/29/73 - 04/19/73 |
|         |         | D23689   | 1    | 04/19/73 - 05/10/73 |
|         |         | D23690   | 1    | 05/10/73 - 05/30/73 |
|         |         | D23691   | 1    | 05/30/73 - 06/20/73 |
|         |         | D23692   | 1    | 06/20/73 - 06/25/73 |
| DR01584 | DS01584 | D23692   | 1    | 06/25/73 - 07/11/73 |
|         |         | D23693   | 1    | 07/11/73 - 08/01/73 |
|         |         | D25135   | 1    | 08/01/73 - 08/21/73 |
|         |         | D23694   | 1    | 08/21/73 - 09/11/73 |
|         |         | D23695   | 1    | 09/11/73 - 10/02/73 |
|         |         | D28139   | 1    | 10/02/73 - 10/09/73 |
| DR01585 | DS01585 | D28139   | 1    | 10/09/73 - 10/23/73 |
|         |         | D23696   | 1    | 10/23/73 - 11/12/73 |
|         |         | D23697   | 1    | 11/12/73 - 12/03/73 |
|         |         | D25136   | 1    | 12/03/73 - 12/24/73 |
|         |         | D25137 * | 1    | 12/24/73 - 01/01/74 |
|         |         | D25138   | 1    | 01/14/74 - 01/31/74 |
| DR01586 | DS01586 | D25138   | 1    | 01/31/74 - 02/03/74 |
|         |         | D25139   | 1    | 02/03/74 - 02/24/74 |
|         |         | D25140   | 1    | 02/24/74 - 03/17/74 |
|         |         | D25141   | 1    | 03/17/74 - 04/07/74 |
|         |         | D25142   | 1    | 04/07/74 - 04/27/74 |
|         |         | D25143   | 1    | 04/27/74 - 05/14/74 |
| DR01587 | DS01587 | D25143   | 1    | 05/14/74 - 05/18/74 |
|         |         | D25144   | 1    | 05/18/74 - 06/08/74 |
|         |         | D25145   | 1    | 06/08/74 - 06/28/74 |
|         |         | D25146   | 1    | 06/28/74 - 07/19/74 |
|         |         | D25147   | 1    | 07/19/74 - 08/09/74 |
|         |         | D29247   | 1    | 08/09/74 - 08/28/74 |
| DR01588 | DS01588 | D29247   | 1    | 08/28/74 - 08/30/74 |

\* THE DATA ON THIS TAPE WRITTEN AS YEAR 1975 IS INCORRECT AND SHOULD BE THE YEAR 1974.

IMP EYE 15.36 SEC STATISTICS TAPE PRODUCED  
BY PHASE II PROGRAM

The following DD card is used to produce the tape.

```
//GO.FT20F001 DD UNIT=(9TRACK,,DEFER),LABEL=(1,SL,,OUT),
//    DISP=(SHR,KEEP),DCB=(RECFM=VBS,BLKSIZE=16564,LRECL=276,LEN=3),
//    VOL=SER=FP4302,DSN=IMPEYE,SUMMARY
```

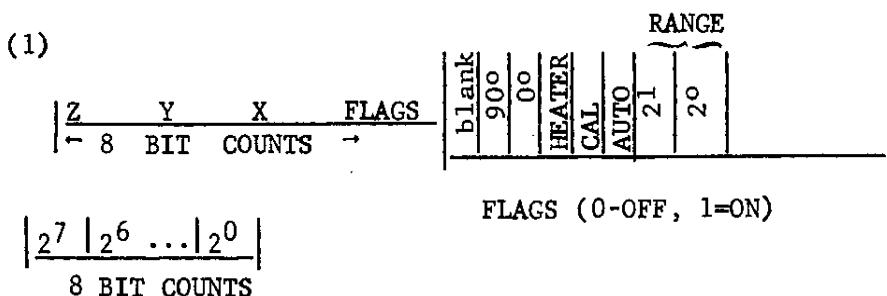
| ITEM | DESCRIPTION                                       | (SIZE) |          | UNITS   |
|------|---|--------|----------|---|
|      |   | (TYPE) |          |   |
| 1*   | Year  | I*4    |          | Last two digits only  |
| 2*   | Day   | I*4    | Days     | Jan 1 = 0   |
| 3*   | Milliseconds of day                               | I*4    | Millisec | Elapsed Millisec in day   |
| 4*   | Data Quality Flag                                 | I*4    |          | (See Def.Ref. 1)  |
| 5*   | Orbit Number                                      | I*4    |          |   |
| 6*   | Bit Rate Flag                                     | I*4    |          |   |
| 7*   | Pseudo Sequence Count                             | I*4    |          |   |
| 8*   | Actual satellite clock<br>from S/C                | I*4    |          |   |
| 9*   | Housekeeping Data                                 | I*4    |          | See Footnote (1)  |
| 10   | Field Magnitude (F1)<br>(Average over 15.36 sec.) | R*4    | Y        | $F_1 = \frac{1}{N} \sum_{i=1}^n F_i$ where $F_i$ is<br>computed by PAYAVG sub-<br>routine over 1.28 seconds |
| 11   | Field Magnitude (F2)<br>(Average over 15.36 sec.) | R*4    | Y        | See footnote (2)  |
| 12   | $\theta$ (Average over 15.36 sec.)                | R*4    | Degrees  | $-90^\circ \leq \theta \leq +90^\circ$  |
| 13   | $\phi$ (Average over 15.36 sec.)                  | R*4    | Degrees  | $0^\circ \leq \phi \leq 360^\circ$  |

\*Items 1 through 9 are for the last sequence included in the 15.36 second statistical computation. For all data processed prior to 1/28/72 these quantities are for the sequence following the statistical computations.

| ITEM | DESCRIPTION   | (SIZE)<br>(TYPE) | UNITS      | NOTES  |
|------|---|------------------|------------|--|
| 14   | Variance XX from averages                                   | R*4              | $\gamma^2$ | Variance matrix over<br>15.36 sec  |
| 15   | Variance YY from averages                                   |                  |            | $\begin{bmatrix} V_{XX} & \cdots & \cdots \\ V_{YX} & V_{YY} & \cdots \\ V_{ZX} & V_{ZY} & V_{ZZ} \end{bmatrix}$ |
| 16   | Variance ZZ from averages                                   |                  |            |  |
| 17   | Variance YX from averages                                   |                  |            |  |
| 18   | Variance ZX from averages                                   |                  |            |  |
| 19   | Variance ZY from averages                                   |                  |            | See footnote (3)   |
| 20   | N   | I*4              |            | Number of sequences<br>over which statistics<br>were computed  |
| 21   | ND  | I*4              |            | Number of detail<br>points over which<br>statistics were<br>computed   |
| 22   | Trajectory Day  | I*4              | Day        | Jan 1 = 0  |
| 23   | Trajectory Millisec of day                                  | I*4              | Millisec   |  |
| 24   | Geomagnetic latitude<br>satellite position                  | R*4              | deg        |  |
| 25   | Geomagnetic longitude<br>satellite position                 |                  | deg        |  |
| 26   | X Geocentric solar<br>ecliptic satellite position           |                  | km         |  |
| 27   | Y Geocentric solar ecliptic<br>satellite position           |                  | km         |  |
| 28   | Z Geocentric solar ecliptic<br>satellite position           |                  | km         |  |
| 29   | Radial distance to satellite<br>from earth center           |                  | km         |  |
| 30   | Y Geocentric solar magneto-<br>spheric satellite position   |                  | km         |  |
| 31   | Z Geocentric solar magneto-<br>spheric satellite position   |                  | km         |  |
| 32   | Geomagnetic latitude sun<br>position                        |                  | deg        |  |
| 33   | Geomagnetic longitude sun<br>position                       |                  | deg        |  |
| 34   | X theoretical geomagnetic<br>field in geocentric solar ecl. |                  | gamma      |  |
| 35   | Y theoretical geomagnetic<br>field in geocentric solar ecl. |                  | gamma      |  |
| 36   | Z theoretical geomagnetic<br>field in geocentric solar ecl. |                  | gamma      |  |

| ITEM | DESCRIPTION                                       | (SIZE)<br>(TYPE) | UNITS | NOTES                                     |
|------|---|------------------|-------|---|
| 37   | Rotation matrix from geocentric solar ecliptic to | R*4              |       | Elements given in the following order:    |
| 38   | geocentric solar magnetospheric. (Items 37 thru   |                  |       | 1 <sup>st</sup> row, 1 <sup>st</sup> col. |
| 39   | 45)   |                  |       | 1 <sup>st</sup> row, 2 <sup>nd</sup> col. |
| 40   |   |                  |       | 1 <sup>st</sup> row, 3 <sup>rd</sup> col. |
| 41   |   |                  |       | 2 <sup>nd</sup> row, 1 <sup>st</sup> col. |
| 42   |   |                  |       | 2 <sup>nd</sup> row, 2 <sup>nd</sup> col. |
| 43   |   |                  |       | 2 <sup>nd</sup> row, 3 <sup>rd</sup> col. |
| 44   |   |                  |       | 3 <sup>rd</sup> row, 1 <sup>st</sup> col. |
| 45   |   |                  |       | 3 <sup>rd</sup> row, 2 <sup>nd</sup> col. |
| 46   | Rotation matrix from celestial inertial to        |                  |       | 3 <sup>rd</sup> row, 3 <sup>rd</sup> col. |
| 47   | geocentric solar ecliptic.<br>(Items 46 thru 54). |                  |       |   |
| 48   |   |                  |       |   |
| 49   |   |                  |       |   |
| 50   |   |                  |       |   |
| 51   |   |                  |       |   |
| 52   |   |                  |       |   |
| 53   |   |                  |       |   |
| 54   |   |                  |       |   |
| 55   | Geocentric latitude<br>satellite position         |                  | deg   |   |
| 56   | Geocentric longitude<br>satellite position        |                  | deg   |   |
| 57   | Right ascension                                   |                  | deg   |   |
| 58   | Declination                                       |                  | deg   |   |
| 59   | $\theta_{SE}$ Averaged over 15.36 sec             | R*4              | deg   |   |

| ITEM | DESCRIPTION                            | (SIZE)<br>(TYPE) | UNITS | NOTES |
|------|--|------------------|-------|-------|
| 60   | $\theta_{SM}$ Averaged over 15.36 sec. | R*4              | deg   |       |
| 61   | $\phi_{SE}$ Averaged over 15.36 sec.   | R*4              | deg   |       |
| 62   | $\phi_{SM}$ Averaged over 15.36 sec.   | R*4              | deg   |       |
| 63   | $X_{SE}$ Averaged over 15.36 sec.      | R*4              | Y     |       |
| 64   | $Y_{SE}$ Averaged over 15.36 sec.      | R*4              | Y     |       |
| 65   | $Z_{SE}$ Averaged over 15.36 sec.      | R*4              | Y     |       |
| 66   | $X_{SM}$ Averaged over 15.36 sec.      | R*4              | Y     |       |
| 67   | $Y_{SM}$ Averaged over 15.36 sec.      | R*4              | Y     |       |
| 68   | $Z_{SM}$ Averaged over 15.36 sec.      | R*4              | Y     |       |



(2)  $F_2 = \sqrt{\left(\frac{1}{N} \sum_{i=1}^N x_i\right)^2 + \left(\frac{1}{N} \sum_{i=1}^N y_i\right)^2 + \left(\frac{1}{N} \sum_{i=1}^N z_i\right)^2}$  where  $x_i, y_i, z_i$  are computed by PAYAVG subroutine over 1.28 seconds

(3) e.g.,  $V_{XX} = (N \sum_{i=1}^N x_i^2 - \sum_{i=1}^N x_i \sum_{i=1}^N x_i) / N(N-1)$

$$V_{ZY} = (N \sum_{i=1}^N z_i y_i - \sum_{i=1}^N z_i \sum_{i=1}^N y_i) / N(N-1)$$



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
GODDARD SPACE FLIGHT CENTER  
GREENBELT, MARYLAND 20771  
January 27, 1975

REPLY TO  
ATTN OF Code 692

*Poor Original*

MEMO

TO: Files

FROM: D. H. Fairfield

SUBJECT: IMP 6 (IMP EYE) Spin Axis Orientation

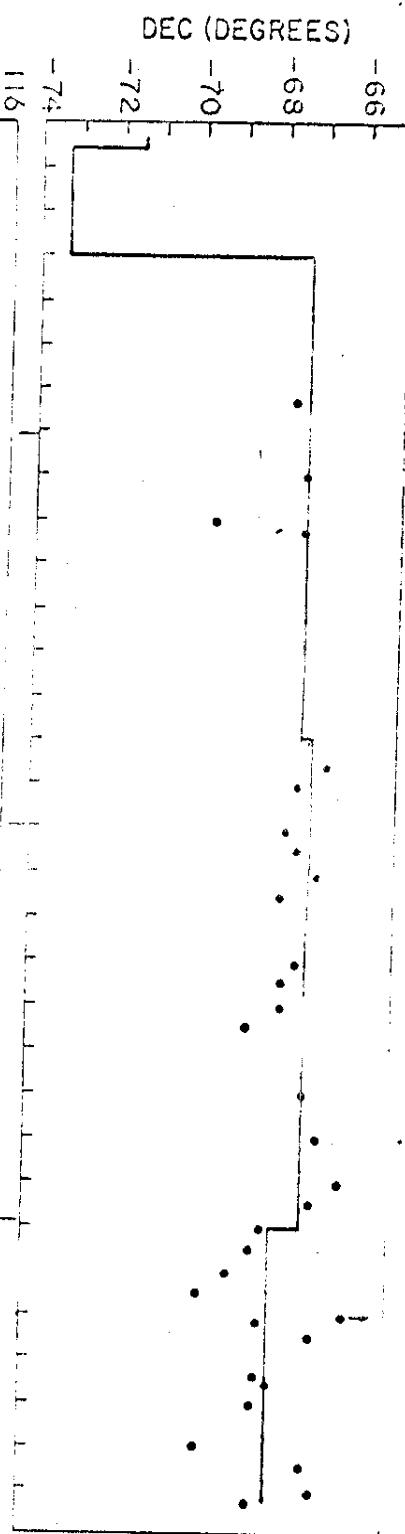
Knowledge of spacecraft orientation represents a fundamental limitation in the accuracy of spacecraft magnetic field measurements. For this reason the following memo was prepared to document the history of the IMP 6 spin axis orientation. The attached plot displays the right ascension and declination of the spin axis vector in inertial coordinates as a function of orbit number for the lifetime of the spacecraft. Points were obtained from Gene Smith of the Information Processing Division (Code 565) and represent his calculations for individual orbits. Data prior to orbit 30 is that contained in a July 30, 1971 memo from S. T. Paddock of the IMP Project Office. Times on the plot were set at an arbitrary fit to the data represent points used in the magnetofield data processing. (Values slightly different from these in the figure may have been used for some of the first 220 orbits of the field data processing). Since the calculated points were determined after the production of experimenter data tapes, it is clear that those inserted on the tapes differ from those in the figure and probably are less accurate. The data suggest that the uncertainty in orientation knowledge is approximately one degree.

The most significant fact represented by the figure is the change with time of the right ascension. Both on July 15, 1971 and October 1972 the spacecraft was reoriented such that its spin axis was (nearly) perpendicular to the plane of the ecliptic. Due to the symmetry of the spacecraft its orientation was not expected to change, yet the data indicate it did change. To my knowledge there is no understanding of why this change occurred.

Donald H. Fairfield  
Space Plasma Physics Branch

IMPROVED VECTOR POSITION IN THE ECLIPTIC PLANE  
AS OF C. 1972 - 46.56°, R.A. = 11.7° - JHK

IMP 6 SPIN AXIS ORIENTATION



112  
108  
104  
100  
96  
92  
88

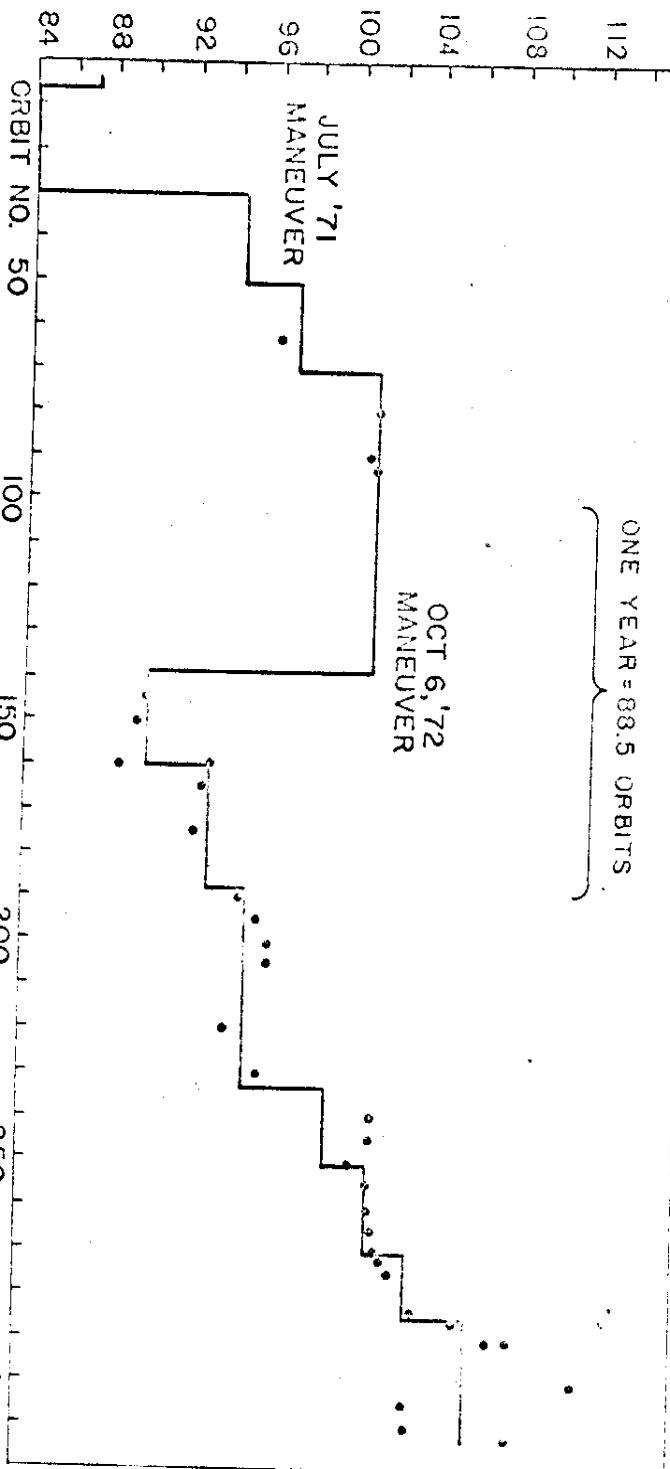
ONE YEAR = 88.5 ORBITS

OCT 6 '72  
MANEUVER

RA (DEGREES)

100  
96  
92  
88

JULY '71  
MANEUVER



```
///GO•FT08F001 DD UNIT=9TRACK,DISP=(OLD,KEEP),LABEL=(*,SL,IN),  
//DCB=(BLKSIZE=16564,RECFM=VBS,LRECL=276,DEN=3),  
//DSN=IMPEYE.SUMMARY,NOL=SER#1823  
//GO•DATAS DCB=*  
//GO•
```

```

//-----FOR YZJRJBK1 GO
IEF2361 ALLOC. FOR YZJRJBK1 GO
IEF2371 232 ALLOCATED TO FTO5F001
IEF2371 232 ALLOCATED TO FTO5F001
IEF2371 331 ALLOCATED TO FTO6F001
IEF2371 331 ALLOCATED TO FTO7F001
IEF2371 331 ALLOCATED TO SYSPRINT
IEF2371 231 ALLOCATED TO SYSPRINT
IEF2371 232 ALLOCATED TO SYSPRINT
IEF2371 0C4 ALLOCATED TO FTO8F001

```

**RECORD LENGTH =** 1 OF 272 BYTES

|          |          |           |          |          |          |          |
|----------|----------|-----------|----------|----------|----------|----------|
| 00C00047 | 00000047 | 03AC3260  | 00000000 | 00000001 | 00B8331F | 000ACCC1 |
| C22E0955 | 42198582 | 422B335F  | 4377430E | 43738E62 | 3F1F07C1 | 425D00A2 |
| 0C0C0030 | 03ABAB88 | C22F54A   | 42A0DC8B | C4163A27 | C2F1C1C  | 3E155555 |
| C3D45B28 | 418C3894 | C42A4F6E  | 442A3A8A | C419H9D4 | 00000000 | C3E22F00 |
| 40E9407C | 00697F22 | C442E66E  | 442E9407 | 41100000 | 00000000 | BFDD5766 |
| 405E47F2 | 00000000 | 406DE67F2 | 40FDCCB4 | 41000000 | 00000000 | C23D4C53 |
| 4311AD3E | 006589D0 | 40EAD6E4  | 421B7F38 | 425E2C0A | 42579999 | C1B50F00 |
| 4311B0E5 | 41A14A4D | C22C4563  | 4179A6A9 | 41A14A4D | C22B7869 |          |

107847 RECORDS IN FILE 1 OF TAPE

```

IEF1421 - STEP WAS EXECUTED - COND CODE 0000
IEF2851 SYS75080.TC91253.RV000.YZJRBK1.LDDMD PASSED
IEF2851 VOL SER NOS= K3SCR4. SYGIN
IEF2851 SYS75080.TO91253.RV000.YZJRBK1.S0000082 DELETED
IEF2851 VOL SER NOS= K3SCR3. SYS75080.TO91253.RV000.YZJRBK1.S0000082
IEF2851 VOL SER NOS= K3CR3. SYOUT
IEF2851 SYS75080.TO91253.SV000.YZJRBK1.R0000079
IEF2851 VOL SER NOS= K3SCR4. SYOUT
IEF2851 SYS75080.TO91253.SV000.YZJRBK1.R0000080 DELETED
IEF851 VOL SER NOS= K3SCR4. SYS75080.TO91253.SV000.YZJRBK1.R0000081 DELETED
IEF2851 VOL SER NOS= K3SCR4. KERT

```

```

IEC280E K 0C4,Z1823 *YZJRBK1*GO
IEF3741 STEP /GO          / START 75080.1025 CPU    OMIN 44.52SEC MAIN 158K LCS  OK
IEF3741 STEP /GO          / STOP   75080.1043 CPU    STEP TIME = 1.37 MINS=CPU=
- STEP 02 - RETURN CODE = C000    IO IN SECS. DISK= 1.40,DRUM=.35,TAPE=.36,17,CELL=

```

Sachheit

14/3/2011

8

TIME=10.43.27.30 DATE=03-21-75

```

AS SED .....  

YS OUT .....  

YS OUT .....  

ELETED .....  

ELETED .....  

YSIN .....  

FLETED .....  

IN),DISP=SHR,  

JR JDMP,  

2SEC MAIN 130K LCS 0K  

CN=70K 10•52•DRUM= .56•TAPE= •21 WINS=(CPU=0000230  

BLKSIZE=BLKSIZE) 0000250  

REC1=137, BLKSIZE=7265 ) 00000260  

BLKSIZE=BLKSIZE) 00000270  

LR ECL=137, BLKSIZE=7265 ) 00000280  

IN),DISP=SHR,  

JR JDMP,  

TITLE BYTES 2  

00000 0000000470 00000000 0156B6CF 0000C4D1M  

3586FA 42426DCD7 40E047CT C422187A 422FFBRA2  

66B0C C2B04F98 443E5291 C419EC6 4456669F  

587 A80 40DF5304 401DFCE2 C0E94078 C0652510D  

DEGA DADB 421D310C 42730858 425E4000 C2437CA3  

0000047 0000000 0156R6DE 0000C4DD 7923D847  

40780F83 4411346C 42371E3 41741364  

44F98 443E5291 C419AEC6 4456669F 446D95F  

6D0 4217FE93 4100000 00000000 00000000  

5304 421DFCE2 C0E94078 C0652510D 40FE3CCF  

310C 42730E5E 425E4000 C24370A3 412137F  

D228 4265FCEF 431782C1 42463C47 01140000  

00000 00156B6E7 0000C4E9 7D193647 C1J2D8C  

406D9067C 4149RE0F 4210B517 00C00000  

5291 C419AECC 4456669F 446D95F 00000000  

5C6 4119AC70 00000000 00000000 00000000  

CE2 C0E94C70 00000000 00000000 00000000  

0858 425E4000 C24370A3 4130A16 414C735  

4711 42325895 42213371 01140000 00000047  

000004C45 81880C47 C316D04 C18CB83  

1253 C216DF07 44645F07 00000000 00000000  

C216669F 446D5EE1 C425DF95 4451C84E  

00000 00000000 00000000 40FB8335 4F00D504  

00000000 00000000 00000000 40FB8335 4F00D504  

44F078 6652510 40FE3CCF 4130A16 414C735  

44F000 24370A3 4130A16 414C735 4F00D504  

C21A6DCC 1140000 00000047 C18CB83 42315C99  

C501 7F8DA47 316586 231360 42315C99

```

D-23662 C-17708  
IMP-1 FR 3264  
START 12/29/71 ORB. # 711  
STOP: 1/18/72 ORB. # 755

1907 RECORDS IN FILE 2 OF TAFFE

2 OF TAPE

PASSED

IEF1421 - STEP WAS EXECUTED - COND CCDE 0000  
IEF2651 - SYS76C75.T104412.RV000.YZJRTJ14.L00M00